Exercise Set 2.3

2. I try to find the average velocity of the ball first:

$$\frac{\text{change in position}}{\text{change in time}} \text{ is written as } \frac{s(c+h)-s(c)}{h}$$

$$V_{ave}(4) = \frac{16(4+h)^2 - 16(4)^2}{h}$$

$$= \frac{16h^2 + 128h + 256 - 256}{h}$$

$$= \frac{16h^2 + 128h}{h}$$

$= 16h + 128$ which is the average velocity at $t=4$

Next, to find the instantaneous velocity at 4 seconds after the ball is dropped, I find the limit to $V_{ave}(4)$ as $h \to 0$

$$V(4) = \lim_{h\to 0} V_{ave}(4) = \lim_{h \to 0} 16h + 128 = 128 \frac{ft.}{sec}$$

So, four seconds after the ball is dropped its velocity is $128 \frac{ft.}{sec.}$

6. I struggled with this problem until I used the approach taken by the authors for the odd numbered problems like this one in the solutions manual. That is, I first found the instantaneous velocity for any second or $V(t)$:

$$V(t) = \lim_{h\to 0} \frac{s(t+h) - s(c)}{h}$$

$$= \lim_{h\to 0} \frac{1}{h}\left[-16(t+h)^2 + 128(t+h)\right] - \left[-16(t)^2 + 128(t)\right]$$

$$= -\cancel{16t^2} - 32th - 16h^2 \cancel{+128t} + 128h + \cancel{16t^2} \cancel{-128t}$$

$$= -16h^2 - 32th + 128h$$

$$= \lim_{h\to 0} -16h - 32t + 128$$

$$= -32t + 128$$

So, I can plug a 5 into this to get the answer:

$$V(5) = -32(5) + 128$$

$$= -32 \text{ ft/sec}$$

So, at five seconds the ball is falling and it's velocity is $-32 \frac{ft}{sec}$